

IDENTIFICATION OF RISKS AND SUGGESTION TO MINIMIZE IT. CASE STUDY OF - SANGLI – KOLHAPUR FOUR LANE PROJECT

S.S. Sayyed¹ M.K. Devtale² P.G. Chandak³ Y.U. Kulkarni⁴

¹Department of Civil Engineering, Annasaheb Dange College of Engineering & Technology, Ashta, Shivaji University, India

²Department of Civil Engineering, Annasaheb Dange College of Engineering & Technology, Ashta, Shivaji University, India

³Department of Civil Engineering, Annasaheb Dange College of Engineering & Technology, Ashta, Shivaji University, India

⁴Department of Civil Engineering, Annasaheb Dange College of Engineering & Technology, Ashta, Shivaji University, India

Abstract— The main roads in India are under huge pressure and in great need of modernization in order to handle the increased requirements of the Indian economy. In addition to maintenance, the expansion of the network and widening of existing roads is becoming increasingly important. This would then enable the roads to handle increased traffic, and also allow for a corresponding increase in the average movement speed on India's roads. Classification and definition of risk in project financing, concluding that the allocation of risks to the parties in BOT projects is the key ingredient for successful project completion. Risk classified according to the following BOT project phases:

- Development phase -technology, credit and bid risks.
- Construction phase -completion, cost overrun, performance and political risks.

Keywords— “BOT”, “Project Risk”, “Public Private Participation”, “Risk Minimization”, “Construction Risk”.

INTRODUCTION

Road construction forms an integral part of infrastructure development. Most of the times, the large-scale projects like road development were taken up by the Government solely, however, this increased the financial as well as labour stress on the Government bodies. Therefore, an alternative arrangement in the form of Private Participation Projects (Public Private Participation) under the headings like Build – Operate – Transfer (BOT) can be applicable. Risks are an integral part of any activity. They can be in very small amounts when the projects / activities are well planned and the possible errors accounted for. However, when no such attention to details is paid, risks can increase. Risk assessment is a good method for such problems where a separate task for studying the projects and evaluating the possible loopholes which may be converted to risks is taken up. BOT projects involve the participation of two or more Governing bodies, thereby resulting in more than one plans of action. These action plans are based on individual experiences of the involved parties and therefore may not be similar to each other. Simultaneously, this results in uneven evaluation of the possible risks.

A road project involves a number of stages, from initial conceptualization to preliminary study, surveying, designing, and design consultation, negotiations on land acquisition, construction work and opening. As the risks at each of these stages differ, they must be properly identified and classified. While the concept of “risk” has been introduced in various fields in recent years, the actual Concept of such “risk” differs from one field to another without a common definition. In the fields of insurance and economics where studies on risks have a long history, a risk is defined as a change of a result which could occur during a specified period under specified conditions uncertainty regarding the actual occurrence of a thing or an object for insurance. The concept of risk debated in connection with the risk management theory is largely classified into the following three categories.

- Risk is the chance of loss

- Risk is the possibility of loss
- Risk is an uncertainty

In addition to these, the word “risk” has other meanings, such as peril and hazard, etc. Having considered such debate, “risk” in social capital development is defined in this study as “A factor of change causing a social loss as a result of impeding the achievement of a goal”. This definition is based on the understanding that there is no special need to separately consider these three categories of risk as the risks in social capital development tend to be a Mixture of these three categories of risk.

Need of Project-

The Sangli-Kolhaour road is major road connecting three main cities of western Maharashtra, namely Sangli-Kolhapur-Solapur. These three cities are fastly growing and developing cities of Maharashtra. Sangli-Kolhapur-Solapur cities are depend on each other. For Industrial Agricultural growth point of view this road is more important. As the traffic volume survey below shows number of vehicles on this road. Count of vehicles increasing day by day so for that purpose the four laning of Existing Road is required. As the number of vehicles increased the number of accidents are also increased. Number of vehicles are increased so as to various number of vehicles are increased so that number of vehicles are more the traffic congestion and accidents are occur in more times. Both sangli and Kolhapur are busy district headquarter places and becoming crowdie due to rapid growth in agricultural, educational as well as in industrial sectors. The improvement of this road will save fuel as well as help in controlling the pollution measures due to emission of smoke from vehicles.

- MSH-3 originates from Ratnagiri in Kokan region and ends at Nagpur in Vidharbha region. Recently part length of Ratnagiri to Kolhapur is declared as NH- 204 by central government.
- Govt. of Maharashtra propose to improve part length MSH-3 from Kolhapur (Shiroli) to BaswanKhind to Ankali via Jaysingpur as two lane. Thus total length of four laning is 25.66 Km, and length of two laning is 26.95 Km. Total length of project is 52.61 Km.
- Both sangli and Kolhapur are busy district headquarter places and becoming crowdie due to rapid growth in agricultural, educational as well as in industrial sectors
- The improvement of this road will save fuel as well as help in controlling the pollution measures due to emission of smoke from vehicles.
- Also both places attracts good amount of pilgrims from all over India being a tourist places. Ichalkaranji “Manchester of Maharashtra” has access on this road from three places which Attracts good business in between Sangli Kolhapur and Ichalkaranji.

PROJECT DETAILS-

Project Name -Road Upgradation (Shiroli-Sangli-Kolhapur) Project

Project Brief- The project involves four laning of Shiroli-Sangli-Kolhapur in Maharashtra on BOT basis

Project Status -Under Construction

Name of client - Executive Engineer, P.W.D.

Name of the Company - Supreme Infrastructure India LTD.

Type of contract - B.D.F.O.T.

Type of PPP- Build-Operate-Transfer (BOT)

Government/Non-Government - Government
Estimated cost of project - 196.05 cores.
Date of work order - 12/09/2011
Extension- 1 year
Duration of project - 2 years
Concession period - 22 years 9 months
No. of lanes – 4
Width of Road – Carriage way 9 m wide For Four Lane
Carriage way 7 m wide For Two Lane
No. of Toll plaza – 2
Nos. of Culverts- 82
Project Capacity - 52.61 KM (Kilometer)

Scope of Risk Analysis for Project-

Sangli-Kolhapur road contract is awarded to Supreme Infrastructure India LTD., by the PWD Maharashtra. This work is come under PWD Kolhapur circle. Work is started on 12 Sept. 2011. Completion time is 2 years but still 40 % of work is remaining. Sangli-kolhapur road work is started in 2011 and expected to be completed at the end of year 2013 but in actual practice due to some reasons the work is not completed and one year extension period is given to company but still only 60 % work is completed. The 40% work of four-way Kolhapur- Sangli is remained incomplete. The work is off for one and half months due to lack of funds at the company. The Project work is kept off for three times. If company started to work, the said project will be completed in 1 year. If company had no money, then why should company undertake such project such question is being asked. Vehicle Drivers are in trouble. They are forward to the project completion. The work of Kolhapur- Sangli took 3 years. Still work of road is in incomplete though date validity finished. Supreme Company and Administration are responsible for this. It is necessary to complete the work as fast as possible. Concerning company should complete the project very soon.

The cost of project is increasing due to this delay. This project suffers from delay and cost overruns, which causes traffic problems, changes of design, poor planning, disputes, cost overruns, poor safety practices and time delays. Work is started on 12 Sept. 2011 and expected to be finished within two year i.e. Oct 2014. to be finished within two year i.e. Oct 2014. The work is not completed as to be expected. The work of By-pass road is also not completed yet work is incomplete still and even in some villages the work is not started yet. Due to these conditions it is become essential to carry an analysis of this project reasons behind this is project suffering from delay and cost overruns, which causes traffic problems, changes of design, poor planning, disputes, cost overruns, poor safety practices and time delays. So due to these conditions it is very important to analysis this project work

Risks Identified and Suggestions to Minimize these Risks-

Environmental Issue

Forests are an important natural resource of India. Forests play an important role in providing raw materials to industries and generating income and employment. They also play a vital role in enhancing the quality of environment by influencing the ecological balance and life support system. Nowadays forest wealth is dwindling due to overgrazing, over exploitation, encroachments, unsustainable practices, projects in the forest areas, withdrawal

of forest products, including fuel wood, timber etc. The area known as Western Ghats is a well-known hotspot of biodiversity. “The Western Ghats constitute range of hills which were once covered with extensive forest all along the length from the Gujarat to the southern part of Kerala. The Northern Western Ghats extend across the three states of Gujarat, Maharashtra and Goa which is also a region that includes several unique ecosystems and harbours a large number of threatened and endemic species. It also includes areas with rich cultural heritage sites”

The issues of illegal tree cutting, deforestation, endangered wildlife and biodiversity are on the agenda of NGOs/Groups in Sangli & Kolhapur district. They have undertaken many awareness generation programmes, action programmes and vagitational activities on these issues. Environmental issue is the biggest issue regarding this project. Number of trees are cut and this was the major issues in starting phase. This is the primary reason for the delay. Environmental clearance is not received early. Near about 3500 trees were cut during this project and this is also biggest issue. This is the first problem faced by this project because of huge number of tree were cut down so in starting phase the project is opposed by people. The delay in receiving the environmental clearance results in delay of project. Environmental clearance is received late because of the tree cutting issue. So that before start of every project environmental clearance should be obtained. Some steps like setting new rules and regulations should be taken. Environmental clearance for this project is not received early before starting the actual work the environmental clearance should be obtained.

Suggestions –

- Environmental assessment of every project should be carried out.
- Process of giving environmental clearance should be improved and proper co-ordination between two government bodies is required.
- Compensatory plantation undertaken
- If possible realignment/ changing configuration of the road
- Forest Area – In bypasses the forest area should generally be avoided or the permission may be sought in advance acquisition is also major factor in delaying of project.

Risks related to Government Regulations -

- Difficulties in obtaining work permits: Among the severest problems related to Government regulations which affect the progress of public road projects is the issuance of work permits. The contractor must obtain work permits from all concerned Government authorities.
- Each of these authorities has its own regulations and rules in issuing work permits. Contractor may face difficulties in obtaining these permits causing delay for the project. Tendering system requirement of selecting the lowest bidder: It is important to reconsider the governmental strategies that encourage the selection of the lowest bidding contractors and to improve the routine procedures and requirements that are required for obtaining work permits.
- Land acquisition: Land acquisition is a sensitive issue so humane, systematic and transparent approach need to be adopted for early and peaceful acquisition. Land acquisition must take place in a manner that fully protects the interests of land-owners and also of those whose livelihoods depend on the land being acquired. So an

adequate compensation package which shall include reasonable compensation for land and resettlement and rehabilitation measures to assuage the sufferings of the affected persons and projects. Land acquisition is one of major problem in Sangli-Kolhapur road till date acquisition of land in Sangli-Kolhapur districts is still remaining. Land acquisition is also major factor in

delaying of project.

The three major locations - Sangli, Ankali and Tamdalge on the Sangli-Jaisinghpur stretch are crucial to the project. The state has decided to bear the land acquisition cost to speed up the work. The total project cost now stands at Rs 270 crore as against the earlier Rs 196 crore for the earlier deadline of October 2014. The previous government could not complete the land acquisition work and necessary clearances and so the project was further delayed. The road-widening project has already been delayed due to the previous government's faulty policies. The project costs were rising, so the state decided to support the ongoing road construction and widening work by bearing some cost of land acquisition. The PWD will make a payment of Rs 30 crore to land owners between the Sangli to Jaisinghpur stretch. In Sangli-Kolhapur road project following are some issues and problems –

1. It was very necessary to give possession of land to Supreme Company to speed four-way. But the villagers of Shirol, Halondi, Herle, Rukdi
2. Atigre, Hatkanagle, tamdalge, Nimshirgoan, Jainapur, Ankali, Dudhgoan, Jaisinghpur, Sangli protested to give agricultural land to the company.
3. The protest increased due to land price is being given at government rate in addition. Whatever the price of land is given villagers of Shirol, Halondi, the same rate was not given to farmers of next villages.
4. The farmers of Nimshirgaon did not get proper compensation at market-rate, so they are in position of protect
5. In Nimshirgaon which is on By-pass road the road passes through school the land acquisition is still remaining in many places.
6. In Atigare near about 200 houses are near road and their land acquisition is still remaining.
7. In Jaysinghpur city near central bus stand land acquisition is still remaining.
8. In Hatkanagale many government buildings are coming under road widening project.
9. In this project land acquisition is done by government rates not by market rates so land passion is not received yet.
10. Land acquisition is biggest problem in this project.
11. Survey for this project was carried out in 2007 and many houses are not taken in survey so land acquisition of these houses and the cost of project is ultimately increased.

Following land custody is prolonged.

1. Houses nearly road – Herle.
2. 200 houses of Atigare village are under Four – Way road. The suitable option is not given yet.
3. Govt. office of Hatkanagale still on the road.
4. Problem of affected houses at Tamdalage.
5. Z.P. School in Nim-shirgaon still on road. Problem not solved.
6. Obstacle of construction at central residency at Jaysinghpur.

7. Land possession of Dhudgoan not done yet.
8. No vacancy / land to Sangli District.

Suggestions –

- Difficulties in regulations are properly corrected and rules are modified
- If necessary new rules should be formed
- Land acquisition should be considered to be done through mutual negotiation.
- Actual estimation of revenues considering traffic surveys & various local effects like monthly/local/return passes is very important
- Detailed Project Report should contain all the parameters including identification of encumbrances and land acquisitions.
- Land Acquisition (LA) – The routine procedure requires lot of time hence LA should be allowed on mutual negotiations beforehand
- Dedicated Teams of retired administrative officials deployed to provide necessary help to Land Acquisition Officers, PWD.
- Innovative methods are used in consultation with line departments like work carried out by the contractor for Shifting of electrical lines and water supply lines.

Risk related to owner -

- Interference in work by owner: interference in work was ranked as the first severest cause related to owner. According to conditions of contract, the owner has the right to suspend any part of work if it is required to restudy or redesign the project to make the necessary modifications. If interference by owner will frequent without reason it may obstruct the work of contractor, and causes delay for the project.
- Delay in decision making: The results indicated that delay in decision making is the second severest cause related to owner. Slowness of owner in making decisions may hold back some of project activities, and delay in settlement of contractor's claims by the owner, such as approval of new work items, prices and additional costs for changes in design. This may obstruct the progress of work and subject the project for delay.
- Delay in progress payments by owner: the results shows that progress payment is third severest cause related to owner. This may occur due to unavailable financial resources to other projects. Without providing the budget, the project remains only in papers without execution.
- Sub-Contracting is done by the Supreme Infra-structure to Sonai Infra-structure and the work is mainly remaining the sub-contracting area ie major work is remaining in Sangli- Baswanna khind which the construction is carried out by Sonai Infrastructre pvt. Limited sangli.

Delay in Finalization of Toll Plaza Location-

1. As per tender provision, they have to construct one toll plaza, (4+4 lane) at km.148/000 & another (4+4 lane) at km 181/100. But in the site visit of Chief Engineer , dated 31/05/2012 it was decided and instructed as instead of constructing one toll plaza at km 181/100, construct 2 toll plaza i.e., one at km 10/850 (5+5 lane) and another at km 181/600(3+3 lanes). Accordingly they had submitted drawing of toll plaza vide office letter no. 115-dated-25/09/2012 for approval. They were started

construction of toll plaza at all places. But local public strongly objecting for construction of toll plaza at km 148/000. This fact has been already brought to notice vide letter no.689-dated-06/03/2014. After that they had submitted toll plaza drawings in available land width i.e. (5+5 lane) at 148/000, (3+3 lane) at 10/850 and (2+2 lane) at 180/600 vide letter no.658-dated-03/02/2014 and 689-dated-06/03/2014.

2. As per instructions, they had submitted revised toll plaza drawing 4+4 lane staggered at km 148/000 and 4+4 lane staggered at 181/000 vide letter no. 891-dated-21/02/2015. It has been given approval to this proposal vide no.3404-dated-31/03/2015.
3. They had managed to convince the local people who are opposing the contracting of toll plaza at km 148/000 and now the work is in progress.

Suggestions –

- PWD should monitor the project properly
- During contracting the sub-contracting details and conditions should be mentioned and PWD should not follow any procedure regarding Sub-contracting.
- Financial conditions of the company should be taken in consideration
- PWD is not take the proper fall up of project for that effective use of software's and project monitoring tools is required.
- Proper supervision and monitoring is necessary for such projects by PWD

Some penalties are set for the delay and compensation should be paid by the contractor.

Financial Risks-

- BOT is a form of project planning and financing, wherein a private party receives a concessions from the private or public sector to finance, design, construct and operate a infrastructure facility for a particular time. The Facility is transferred back to the government authority after the concession period ends. Day by day the Indian Infrastructure development has been growing due to huge investment therefore; the traffic intensity on the road is more than capacity of road. The existing road network is necessary to improve to accommodate the future traffic and to provide the good quality. The BOT model has many of challenges concerned in developing and financing the road projects. The huge funds are required to develop road networks. The Indian infrastructure has restrictions due to financial unavailability and limited budgetary sources. So, there is need of attracting the private finance in India. The most critical risk element that impacts project cost/cash flow under JVs belongs to the financial risk category. This risk factor is —fluctuation of exchange rate. Client's cash flow problems were also identified to have major impact on the execution time of the project. This often involves the client's ability or inability to fund the project through to completion or to make timely payment upon submission of invoices by the contractor. The investor or lenders is aware the existence of currency risk in any BOT projects and it does occur due to funding from international banks or foreign companies; creates volatility of the exchange rates. Bing et al. have stated that fluctuations in currency considered as an austere problem in international transactions. In contrast, interest rate will affect the project in terms of borrowing and debt payments. Any fluctuation in the interest rate will definitely affect the lenders. An

appropriate interest rate should be agreed upon the project. The lenders have to pay extra cost if the interest rate is far high or benefit them if the interest rate is low. More foreign investors or private sector could be attracted by providing interest rate guarantee by the host government in a BOT project. This approach has been adopted in Indonesian BOT toll road whereby the government has guaranteed on maximum interest rate, minimum revenue guarantee, debt guarantee, tariff guarantee and minimum tariff guarantee. Performance of the concessionaire is crucial in seeking for fund to implement a BOT project. Usually, equity risk is related with the performance of the company which is measured by the share price of the company. The higher the share price goes, in definite, benefit the shareholder but the lesser it goes will affect the prestige of the concessionaire. Capability of the company in raising capital for the BOT project is reflected on the share price. It has been believed that, the equity investors and other long term investors will only agree to provide the amount of funding for BOT project upon the promoter has proven their financial capability of the project over its entire life span. It is very difficult to attract domestic capital of debt and equity especially in East Asia when it is involving huge amount of investment in an infrastructure project. Nevertheless, the competence in carrying out detailed and comprehensive feasibility study, economic and risk assessment study, ensure the promoter to be in better position in obtaining domestic equity finance for funding the BOT project. This risk mostly related to the facility's operation which consist of materials supply, labour supply, equipment availability, inflations, tariffs, fiscal policies and exchange rates. Project cash flow is affected by any financial aspects that relate to the economic parameters. Increment in supplier to stock the materials upfront at lower price and the promoter able to generate the required output within the stipulated cost, not burdening the public by increasing the tariff. Apart from that, it will secure long term revenue for the promoter by selling the output to the client

- Due to delay in construction cost of the project is increased now project cost is increased due to increase in the cost of material and cost of labour and the cost of other things.
- Payment problems between contractor and his employees: Some contractors encountered reduction in their financial resources due to the "Credit Crunch", the global financial crisis. Cash requirement for procurement of materials and other expenses could lead the contractor into a very critical situation which may obstruct the progress of work and postpone the project completion time.
- Cost of project is increased due sub-contracting also reason for financial risks.
- Cost of the project is increased due to increasing prices of material.
- Sub-contracting is done and payment of sub-contractor is not given by the supreme company so due to this major work is uncompleted.
- Due to change in pavement design there is huge increase in quantity of earthwork in filling.
- From September 2015 Royalty rate has been increase from Rs.200/brass to Rs.400/brass.
- The overall effect of Royalty tax on earthwork and metal is nearly about 12.00Cr as compared with tender estimate.
- They have spent Rs 40.00Cr against variation cost Rs.76.00Cr.

- But due to non-approval of variation, their financier has delay the disbursement which delayed the project time line.
- SPV has invested so much money beyond concession agreement estimate.
- Utility shifting is also one of the issue regarding cost increased as cost of utility shifting is less in contract but in actual practice this cost is more.

Table no. 1 –Utility Shifting cost table.

SR NO.	Type of utility	Cost as per tender in lacs.	Cost as per execution in lacs.	Remark
1	Water pipeline shifting	60	671	Increase in huge length of water pipeline shifting and MSEB work was shifting. They can't start the road work before complete the utility shifting.
2	MSEB pole shifting	125	657	
3	Utility pipes	40	94	
4	Tree cutting and Tree plantation	100	174	

Table no. 2 –Change in Design.

Crust layer	Thickness as per tender	As per pavement design	Remark
Wearing course	25mm SDBC	40mm BC	Increase in cost
Bituminous layer	75mm BM	70-100mm DBM	Increase in cost
GSB	320mm	200mm	
WMM	300mm	250mm	
Earthwork	150mm	500-1000mm	Increase in huge quantity in murum filling in BC soil stretches

Suggestions-

- The variation in material cost allowed upto 25% of the Contract Amount.
- Government of Maharashtra and agencies like IL&FS (Infrastructure Leasing & Financial Services) will contribute on 50:50 basis.
- By taking Soft Loan from GoM which is Sub Debt without interest and Repayable to Government of Maharashtra after retiring senior lenders' dues.
- Borrowings from market that is agencies like IL & FS in Karnataka and Rajasthan roads are constructed using Finance from agencies like IL & FS.
- Some percentage of money should be invested by government.
- Government land near the proposed work can be utilized for reducing concession period.

Causes related to Consultant-

- Results showed that there are three severe causes related to consultant, these are: Delay in solving design problems, Major change of design during construction by

consultant, Bad project cost estimation. It can be observed that these causes are related to insufficient experience of the consultant's staff. When consultant makes fundamental changes in design, the contractor may face difficulties in construction or in finance because these changes weren't planned. Moreover, when projects' costs are under-estimated, it may be suspended by the owner due to his inability to finance additional costs. Additionally, delay in approvals by consultant could delay the progress of work and may cause delay in completion time of the project.

- Technical risk or consultant risk could be classified into construction risk and O&M risk. Essentially, technical risk is the most common and well understood form of risk. Technical risk is the subject of close surveillance. To minimize the technical risk, the concessionaire is responsible to evaluate the risk in detail to ensure the project will be constructed accordance to the design specification and host government's requirements and functioning well. Thus, well reputed and established consultant together with an experience contractor should be hired to implement the BOT project without any tolerance to the standard codes and practice.
- **Construction risk** : Unknown ground conditions, delay in procuring of construction materials, and price escalation of raw materials for construction such as an increase in the price of steel, copper or aluminum are the problems related to construction risk which occur during construction phase. In addition to that, poor design report, prolong construction schedule and changes in factor of production also contribute to construction risk. It is essential to made available the design report and to be vetted by the owner and consultant before any BOT project commence. Preferably, to have a third independent party to audit and comment the design and construction methodology which would help to minimize the construction risk.

Operational and Maintenance Risk-

During this phase there are several associated risks. One of them is when the performance of facility is not to the required level due to technical problems. Selection of inefficient machineries and equipment's during the implementation phase and poor workmanship during installation phase could cause the poor performance. The spare parts for the selected machinery and equipment's for the facility are to be ensured that they are easily available at affordable cost. Throughout the concession period, the machinery and equipment's will undergo some routine service due to wear and tear process, to optimize the performance. New available technology should be incorporated to ease the operation phase. Sometimes, initial cost is very high but in long run it will benefit the consortium. The operation and maintenance team requires specialized technical skills and abilities in operating the facility. Inefficient team would lead to unnecessarily high cost of operating and resulting lesser revenue to the consortium. It is very important that a proper agreement should be established to ensure the interest of the operator is secured. The efficiency of the facility's operation could be increased by providing maintenance manual and update it on a regular basis together with standard operating procedure.

- This problem we can see in Nimshirgaon a road passes through the school building.
- In hatkangale also the road passes through government offices.
- In Jaysinghpur city also road passes through main city and it may cause traffic problems.

Suggestions –

- Detailed Project Report should contain all the parameters including identification of encumbrances and land acquisitions
- Alignment should be proper such that minimum problems are occur.
- Maintenance for 5 years is responsibility of the contractor
- Monthly fees has been paid to the contractor
- Maintenance is evaluated on the basis of 7 Asset Groups
- Provision of carrying out maintenance at risk and cost of the contractor
- Insurance of new road pavement is also one option in this by insurance money we can utilize for the maintenance and repair purpose.

Conclusion-Other than the suggestions already mentioned some important suggestions will have to be considered for transportation project are as follows:

Other recommendations/ suggestions –

- DPR should include all the details required for execution and the DPR Consultants should be entrusted with supervision work
- Stringent technical and financial criteria to ensure only the best IIMC contractor(s) are engaged for improvement works and are also responsible for maintenance for five years thereafter
- Land Acquisition (LA) – The routine procedure requires lot of time hence LA should be allowed on mutual negotiations beforehand
- Forest Area – In bypasses the forest area should generally be avoided or the permission may be sought in advance
- Value Engineering & Technical Optimization
- Railway Clearances. Timelines to be prescribed for Railway clearances.
- Proactive support from concerned Government must for sorting out local issues, utility shifting, encumbrances removal etc
- Appraisal of performance of Supervision Consultant
- Insurance of new road pavements and bridges on newly constructed road.
- Provision of Speed Traps to control the speed of vehicles.
- In Some regions speed breakers are also necessary
- Speed limits for the vehicles should be set to reduce the accidents
- In some places i.e. near Chokak safety railings should be provided
- Emergency services are also provided
- Employer should have liberty to engage nominated assignee contractors, if required

References-

- [1] A. McGoe-Smith, A. Poschmann and L. Campbell, “*Quantitative Risk Assessment and Risk Management of a Large Transportation Project*”
- [2] Elizabeth Deakin, Karen Trapenberg Frick, and Kathleen Phu (2014), “*risk Assessment and risk management for transportation research*”
- [3] Engineer Rinaj Pathan1 & Prof. Dr. S. S. Pimplikar”, *Risk Assessment of BOT Road Projects*”
- [4] Guidelines for Investment in the road sector (2015)
- [5] Katkar M.B., Dr. Khandekar S.D., “*Study of risk management for National Highway Project*”
- [6] Ms.Yogita Honrao, Prof.D.B.Desai, “ *Study of Delay in Execution of Infrastructure Projects –Highway Construction*”
- [7] Maher, M L J McGoe-Smith, A D (2006), “ *Risk-based cost and schedule estimation for large transportation projects* ”
- [8] Oladiran, Olatunji Joseph (2009), “*Causes And Minimization Techniques Of Materials Waste In Nigerian Construction Process*”
- [9] S. M. Vidalis, F.T. Najafi (2002), “*Cost And Time Overruns In Highway Construction*”
- [10] SCOTT SPRINGER, Roy F. Weston, Inc., “*Waste Management in Transportation the Present and the Future*”
- [11] V. THOMAS, SATYANARAYANA N. KALIDINDI and L. S. GANESH, “ *Modelling and assessment of critical risks in BOT road projects*”
- [12] Vivek Sadashiv Jadhav & Abdul Rashid Chand Attar, “ *Economical Evaluation of Build-Operate-Transfer Project, A Case Study*”
- [13] Yukiya SATO, Keiichi KITAZUME and Kazuaki MIYAMOTO (2005) , “*Quantitative risk analysis of road projects Based on empirical data in japan*”

